DOCUMENT RESUME

ED 263 090 SP 026 763

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TITLE Building Bridges Between Public Schools, Industry and Higher Education: Collaboration in Mathematics and Science.
PUB DATE 24 Jul 85
NOTE 12p.; Paper presented at the World Assembly of the International Council on Education for Teaching (32nd, Vancouver, British Columbia, Canada, July 22-26, 1985).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Community Resources; *Cooperative Programs; *Educational Technology; Elementary Secondary Education; Higher Education; Mathematics Instruction; *School Business Relationship; *School Community Relationship; Science Instruction

ABSTRACT

Collaborative projects developed between business and industry, public schools, community agencies and institutions of higher education can provide benefits for all participants. This presentation describes the establishment of a cooperative program between the University of North Carolina-Charlotte, the 15 school districts in the Southwest Region of North Carolina, businesses and industries, and community agencies such as local museums to promote interest in math and science education. A computerized resource bank of "talented presenters" from the groups mentioned above was developed. It identifies people who are available to visit regional classrooms to demonstrate a principle or concept related to mathematics, science and technology, thereby generating interest and illustrating the practical use of science, mathematics and technology. The Talented Presenters Resource Bank is being compiled for access and use by the regional public and non-public schools and serves approximately 10,000 teachers in the Region. Principles which gird effective collaboration and specifics of the program, such as participating agencies, range of presentation topics, and procedures are included. (Author)

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Curriculum and Instruction

704/597-2531

April 10, 1985

PROPOSAL
Thirty Second ICET World Assembly
Education in the Information Age:
The Impact on Teacher Education and Teaching

Topic: # 3 Higher Education and the Private Sector-Principles of Collaboration

Title of Presentation: Building Bridges Between Public Schools, Business and Industry and Higher Education: Developing a Computerized Resource Bank to Promote Science and Math Education

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ABSTRACT

Collaborative projects developed between business and industry, public schools, community agencies and institutions of higher education can provide benefits for all participants. This presentation will describe the establishment of a cooperative program between the University of North Carolina-Charlotte, the 15 school districts in the Southwest Region of North Carolina, businesses and industries, and community agencies such as local museums to promote interest in math and science education. A computerized resource bank of "talented presenters" from the groups mentioned above was developed. It identifies people who are available to visit regional classrooms to demonstrate a principle or concept related to mathematics, science and technology, thereby generating interest and illustrating the practical use of science, mathematics and technology. The Talented Presenters Resource Bank is being compiled for access and use by the regional public and non-public schools and serves approximately 10,000 teachers in the Region. Principles which gird effective collaboration and specifics of the program such as participating agencies, range of presentation topics, and procedures will be included.

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Building Bridges Between Schools, Industry and Higher Education: Collaboration in Mathematics and Science

Paper presented at the

International Council on Education for Teaching 32nd World Assembly

Vancouver, British Columbia

July 24, 1985

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Encouraging the interest of students in mathematics and science has become a national priority in recent years. Maintaining a role of leadership in a world of high technology requires a population proficient in understanding and applying mathematical and scientific concepts. As a result, teacher preparation programs have increased math and science components in both content and methodology and coursework has been made more rigorous. For students across the country, high school graduation requirements now include more courses in math and science. The teaching of math and science in the elementary and middle grades is also receiving renewed emphasis. In addition, national leaders have encouraged people in business and industry to work together with schools and universities to enhance science and mathematics programs.

As a part of this trend, UNCC's Mathematics and Science Education Center has formed a network with the fifteen school districts in its region, local businesses, industries and community agencies, including area nature and science museums. From this network, a number of collaborative projects have been generated. The purpose of this paper is to describe several of these projects and to discuss the principles which undergird effective collaboration.

"Guest Presenter" Resource Bank

A "Guest Presenter" Resource Bank is being developed which identifies people from business and industry who are available to visit classrooms in the Region. The individuals will demonstrate and talk about a principle or concept related to mathematics, science and technology, thereby

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generating interest and illustrating the practical uses of these disciplines. The data bank is being compiled to serve 10,000 teachers in K-12 classrooms in the area.

Duke Power, the company which supplies electricity for the Piedmont area of the Carolinas has pioneered the development of a similar computer-based resource bank for teachers as part of its "Power in Education" program. Duke employees at all plants and sites across both states were surveyed on a form compatible with INFOSTAR (used with the IBM-PC). the survey questions for the employees elicited information about the kinds of volunteer work with schools they had done previously, their willingness to help schools with educational efforts in particular roles (tutoring, instructing, fund raising, etc.), and specific subjects or skills which they could teach. Subjects include math, physics, biology, accounting, computer technology, chemistry, economics, interviewing skills, business management, and skills such as design, graphics, and carpentry. In addition, blank slots are provided for other subjects or skills the employees may name. More than 2,000 records are currently on line. The records are coded to be arranged alphabetically by location or to be arranged according to skills or subject matter available or in a variety of other ways. An evaluation component has also been built into the program.

The "Guest Presenter" resource bank being established through the UNCC Math and Science Education Center will expand this concept to include personnel from many businesses and industries in the area. Through the Center, teachers in the region will receive information about the Guest Presenter program and forms for them to request services will be provided.

Role-Model Directory

Another resource for the math and science teachers being developed collaboratively with local business and industry is the "Role Model Directory." A spin-off from the national "EQUALS" Program, the Directory will list the names of females and minorities employed in the community who hold positions where knowledge of math or science is required. The people whose names are included have agreed to visit in schools to talk informally with small groups of junior high and high school students, primarily females and minorities, to encourage interest in careers related to science and math.

Research has indicated that often female and minority students do not anticipate the utility of science and mathematics in their lives and that they frequently lack confidence in their ability to perform well in the fields of math and science. Frequently, teachers have low expectations regarding the performance of female and minority students in math and science. These reasons appear to account for females and minorities taking a minimum number of math and science courses and choosing fields unrelated to science and math careers.

The development of the Role-Model Directory is designed to combat this trend. Female and minority students will have an opportunity to ask questions and talk informally with other females and minorities in a variety of occupations which require knowledge of math and science. In addition to a wide range of occupations represented, the goal of the Directory is to include people whose training in science and math range

from the high school level through the doctorate. Also included will be recent high school graduates as well as older people who have established second careers.

Martin-Marietta Mining and Geology Program

Martin-Marietta, a mining corporation with a facility near Charlotte, asked the UNCC Math Science Center for assistance in developing an effective program to educate teachers regarding the benefitsto society which their industry provides. To offset the negative charges of destroying the environment typically levelled at mining companies, Martin-Marietta sought to enhance teachers' understanding of the practical applications of geology and of the company's efforts to reclaim land and provide healthy working environments for employees. Working together, a unique, on-site program was developed by UNCC faculty, a master teacher from the public schools and Martin-Marietta personnel. Mineral resources were studied from three perspectives. A university geologist provided instruction about basic geology including the evolution of the earth and the formation of the land. An industrial geologist talked about the economic significance of rocks and minerals, and their use in materials for building homes, driveways and roads. Teachers learned about the specific gravity of the minerals and their suitability for various applications. In addition, an environmental engineer talked about environmental control including safe levels of dust, hazard-free surroundings for workers and land reclaiming programs maintained by the company. Each of the three professionals was also demonstrating the use of their training in the sciences applied in different ways. Teachers were also taught how to

locate materials which are found naturally in their local areas, eliminating the need to buy costly educational materials from suppliers.

Martin-Marietta provided support for the development of the course as well as stipends for the teachers who participated. As an outgrowth of this highly successful project, Martin-Marietta went to other mining companies, and convinced them to enlist the cooperation of schools and universities near them to develop similar programs.

Careers Exploration Workshop and Iredell County Schools "Water" Program - Duke Power

The final projects to be described are examples of needs identified by school and university faculty and presented to industry for their cooperation in providing a response. Duke Power Company sponsored these programs, both requested by local school districts and the UNCC Math-Science Center. One, the Career Exploration Workshop for vocational education teachers was designed to provide instruction related to industrial employment in science careers. The teachers were given "hands-on" experiences in the power company's environmental laboratories during the afternoon portion of three day blocks of instruction. UNCC professors provided instruction in the basic sciences related to these careers during morning segments.

In the final example, the power company again responded to a need identified by a local school system and university personnel. With the industry interacting with the university, a program on water was designed so that each institution provided what it could do best. The properties and uses of water were investigated from various perspectives and

disciplines. The pilot project features twenty, two-hour units designed for thirty high school students to work together with fifteen high school teachers, university faculty and personnel from Duke Power. A curriculum design will be developed and evaluated. The first fifteen teachers will then train more teachers in its use.

Principles of Effective Collaboration

The projects described are representative of the variety of collaborative programs which can be developed between schools, industry, and higher education. In reflecting upon them, certain principles seem to emerge which lead to effective collaboration.

-Help all participating groups understand the mutual benefits of collaboration.

Benefits to business include the recruitment of students to fields related to the business, enhancement of image in the community and influences in the education of its future employees. Thus collaboration can be regarded as an investment in its own long-range viability and continuing growth. Higher education faculty can grow in awareness of the practical application of concepts and principles which they typically teach in more "basic" or research oriented fashion. School teachers, often having lived lives related primarily to schools, rather isolated from other occupations, gain understanding of the needs of industry in selecting employees.

-Industry will support programs specially designed to address their needs as well as benefit the public schools. Usually, personnel from business and industry are familiar with courses traditionally taught in math and science, and are not convinced they are as effective as they could be. Thus, they are not interested in funding them. Programs designed to present both basic concepts and their application in society are the types likely to be supported.

-Present representatives from industry with specific ideas and proposals. Requests for support for vague, catch-all concepts or for general programs are likely to be turned down. Specific, uniquely designed programs with distinct purposes are appealing.

-Young executives with children in school tend to be motivated to aid the schools. Seek their support and make use of their motivation.

-Community-based steering committees composed of representatives from industry, schools and community institutions such as museums can be helpful in providing advice for higher education and in publicizing and promoting collaborative efforts. Be sure meetings are well-planned and that participants follow a prepared agenda.

Working together on cooperative projects in math and science provides opportunity for participants to better understand the point of view of the

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other collaborative partners. Collaborative programs developed between the private sector, the schools and institutions of higher education are beneficial for all.

POWER IN EDUCATION QUESTIONNAIRE

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Soc. Sec. No.

Today's Date
M M D D Y Y

Last Name

Physical Work Location

First Name

Middle Initial

Closest Duke Power Customer Office

PART A

Please enter a "1" if you have performed volunteer work for the schools within the past year in the following areas (leave blank if it does not apply).

1. ☐ Served on Education Advisory Committee
2. ☐ Tutored
3. ☐ Worked on fund raising projects for educational materials and equipment
4. ☐ Served as class instructor or advisor

If there are other areas please describe them below:

5.

6.

7.

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PART B

Please enter a "1" if you would be willing to help your local schools in their educational efforts in the following areas (leave blank if it does not apply).

1. ☐ Serve on Education Advisory Committee
2. ☐ Help with fund raising projects
3. ☐ Tutoring
4. ☐ Class instructor

If you selected #4 please enter a "1" to indicate which of the following subjects you would be willing to teach:

5. ☐ Math
6. ☐ Physics
7. ☐ Biology
8. ☐ Accounting
9. ☐ Computer Tech.
10. ☐ Chemistry
11. ☐ Economics
12. ☐ Interviewing Skills
☐ Business Management

If there are other subjects, please describe below:

14.

15.

16.

Identify by entering a "1" other skills you would volunteer for PIE educational efforts:

17. ☐ Design
18. ☐ Graphics
19. ☐ Carpentry

Describe any other skills below:

20.

21.

22.

Send through company courier to:
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